APPENDIX I

BEST MANAGEMENT PRACTICES

The California Department of Food and Agriculture (CDFA) Hydrilla (*Hydrilla verticillata*) Eradication Program's Best Management Practices are designed to ensure worker and public safety, environmental compatibility, protection of Threatened and Endangered Species, and maximize treatment efficacy and efficiency.

WORKER SAFETY AND ENVIRONMENTAL COMPATIBILITY

Herbicide Use

All herbicide applications should take place only after local stakeholders have been notified. Planned applications may be reviewed by affected local government agencies.

The CDFA Hydrilla Eradication Program only uses herbicides, surfactants, and other adjuvants that are registered for use in an aquatic environment by the California Department of Pesticide Regulation (CDPR).

In order to ensure proper aquatic herbicide applications, the CDFA Hydrilla Eradication Program requires that all applications be made under the supervision of an applicator certified for aquatic herbicide applications by the CDPR (Qualified Applicator Certificate or Qualified Applicator License).

The CDFA Hydrilla Eradication Program requires that all applicators follow the herbicide label directions for personal protective equipment[1] when loading, mixing, or applying herbicides. At a minimum, all applicators will wear eye protection, gloves[2], long sleeve shirts, long pants, and shoes with socks.

In order to avoid inadvertent or accidental soil or water contamination with aquatic herbicides, the CDFA Hydrilla Eradication Program follows the storage, transport, and spill control procedures recommended by the CDPR and the United States Environmental Protection Agency.

In order to ensure the use of correct application rates, the CDFA Hydrilla Eradication Program follows all label directions as to application rates and timings. Surface acreages are determined using Global Positioning System/Geographic Information System technology. Water depths are determined by using depth meter sticks in shallow water and by calibrated weighted ropes or depth finder in deeper waters.

In order to ensure the use of correct application volumes, the CDFA Hydrilla Eradication Program routinely cleans and calibrates all herbicide application equipment.

In order to avoid spray drift, the CDFA Hydrilla Eradication Program follows all label directions and all CDPR guidelines as to acceptable application weather conditions. For

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[1] Neither the Komeen® herbicide label nor the Sonar® SRP herbicide labels require the use of specific personal protective equipment.

[2] Eye protection and gloves required by California Code of Regulations, Section 6738 (b).

instance, aqueous spray applications are not made in winds above 10 miles per hour, or in temperature inversions (unless they are applied through subsurface injection).

The CDFA Hydrilla Eradication Program obtains all applicable permits from the local county agricultural commissioner before any herbicide application. All applicable records are maintained, and all required reports will be filed with the county agricultural commissioner (including the Monthly Pesticide Use report), as required.

All transport or shipment of herbicides and other chemicals by program personnel will be in compliance with the California Department of Transportation, and United States Department of Transportation, laws, regulations, and guidelines. Packages containing herbicides and other chemicals, and vehicles transporting them will be properly labeled and/or placarded.

The enforcement of all state pesticide storage, transport, and application laws and regulations is under the direction of the local county agricultural commissioner, who has the right to inspect the CDFA Hydrilla Eradication Program for compliance at any time. In addition, the enforcement of all federal pesticide storage, transport, and application laws and regulations on federal property is the responsibility of the appropriate federal agency, who has the right to inspect the CDFA Hydrilla Eradication Program for compliance at any time (such as the United States Army Corps of Engineers at Eastman Lake). The CDFA Hydrilla Eradication Program cooperates with these inspections, and immediately corrects any deviations found.

Physical Removal Treatments

All applicable permits will be obtained from the California Department of Fish and Game (CDFG) for streambed alteration, before dredging.

For hand removal of plants, all reasonable care will be made to extract the tubers and the plant crown from the hydrosoil when the plant is removed.

All plant material will be disposed of in a manner that hydrilla cannot sprout and re-grow from tubers or other plant parts.

Dredging and hand removal of plants will be performed by trained personnel only.

THREATENED AND ENDANGERED SPECIES

In order to avoid inadvertent or accidental take of listed species, the CDFA Hydrilla Eradication Program consults on an annual basis with the United States Environmental Protection Agency/CDPR Protecting Endangered Species Interim Measures Program[3] and the local county agricultural commissioners, as to the presence of any Threatened and Endangered Species in or near the project areas, and follow any prescribed mitigation measures.

The CDFA Hydrilla Eradication Program conducts annual training sessions for survey and treatment crews on Threatened and Endangered Species. The training sessions

[3] Also known as the County Bulletin program.

are presented by personnel from the CDPR, and include identification of Threatened and Endangered Species in survey and treatment areas, and mitigation measures.

OUTREACH AND EDUCATION

Public Awareness is essential to the CDFA Hydrilla Eradication Program in order to expand detection efforts to areas where CDFA staff may not be able to survey and halt the spread of hydrilla. Survey efforts may be enhanced by door-to-door distribution of educational materials in "high-risk" areas near the focal point of an infestation.

In order to educate the public on the value of the CDFA Hydrilla Eradication Program, biologists from the CDFA and local county departments of agriculture give public speeches and presentations on hydrilla biology and control. The CDFA Integrated Pest Control Branch and other parties produce pamphlets that are distributed to public agencies and weed management area groups to help the public identify hydrilla and know where to report its occurrence.

Communication with other agencies and experts and keeping abreast of new tools is an integral part of our CDFA Hydrilla Eradication Program. This may include new herbicides, herbicide formulations, herbicide application equipment or methods biological control agents, physical and mechanical removal equipment and methods, and survey and assessment equipment and methods.

WORKING WITH THE PUBLIC

In order to maintain the best possible working relationship with private landowners and the public, local county departments of agriculture are consulted when hydrilla surveys are conducted within their jurisdiction. The CDFA staff then work with the county departments of agriculture to develop a plan to address the survey findings, and perform any required eradication work.

In order to maintain the best possible working relationship with the public, the CDFA staff makes it a policy to stop control activities in order to answer program related questions from interested or concerned citizens.

In order to maintain the best possible working relationship with private landowners, the CDFA notifies landowners when hydrilla is detected on their property, and consent is sought for the CDFA staff to eradicate these plants from their lands.

In order to maintain the best possible working relationship with private landowners (and the public), efforts are made as a courtesy to notify landowners when herbicide treatments are being conducted in nearby areas adjacent to their lands.

TREATMENT EFFICACY AND EFFICIENCY

It is the policy of the CDFA Hydrilla Eradication Program to use the most appropriate eradication tools, or combination of tools, at each site. In order to adopt the appropriate tools, the following site characteristics are considered:

1) Site Accessibility: The more difficult the access, the less weight and amount of equipment that can be safely carried to the site. In addition, it is more difficult to

transport large volumes of plant matter away from the site for disposal. In this situation, the use of pellet or liquid formulation of fluridone herbicide might be more appropriate than copper herbicides, due to their low toxicity and ease of portage.

2) Site Location: A hydrilla infestation next to a river that can flood would require immediate action. This would favor burying, excavating, and fumigating as control methods.

3) Water Clarity: Only relatively clear water sites are appropriate for divers and diver assisted dredging.

4) Water depth: The deeper the water, the more appropriate the use of pellet herbicide formulations or sub-surface injection of liquid herbicides. This would allow release of the herbicide directly on the plants and decrease the dilution factor.

5) Water Quality: The pH (acidity) and turbidity affect the choice of herbicide. Diquat is ineffective in turbid water, and alkalinity can affect the efficacy of copper aquatic herbicides. In addition, algae can obscure hydrilla from visual observation and effect herbicide uptake. Sometimes applications of algaecides, or physical removal methods such as raking, or high-pressure water injection, may be necessary to remove silt or algae from leaf surfaces prior to herbicide application for hydrilla eradication, to improve herbicide uptake.

6) Water Uses: The use of the water in the water body has a major effect in determining the proper control method. For instance, if the water is used for irrigation of crops or potable water for humans or livestock, some herbicides may not be used or may require a specific holding time of the water prior to it's use.

7) Water Flow: The faster the water flow the more appropriate the use of copper aquatic herbicides applied through metering devices or gravity flow devices. Metering in the copper herbicide at low rates allows for longer exposure of the hydrilla plants to the herbicide and improves efficacy. Very slow water exchange or convection currents in large water bodies being partially treated might be more acceptable for the slow release pellet formulation of fluridone at low rates with periodic applications, as in Clear Lake.

8) Water Control: In water bodies where the level of water can be easily controlled, the use of draw down to expose plants and tubers to drying and prevent further tuber formation can be used. Fumigation of soils can be considered when the water body is in draw down.

9) Hydrosoil Type: Heavy clay soil makes dredging with a suction dredge difficult. In addition, organic, mucky soils affect the use of slow release pellet herbicides (they become buried in the soft soil, and the active ingredient becomes inactivated by the organic matter). Use of an aqueous solution or a different, faster release pellet formulation might be considered. In water bodies with hard, solid bottoms, such as asphalt or granite, physical removal is very effective.

10) Weed Size: Large hydrilla plants or plant mats may require either hand pulling, mechanical control, or use of copper aquatic herbicides for rapid control before tubers can form. Large hydrilla plants can be treated with fluridone, but the length of time required for control can be several weeks to months. Therefore, the use of copper aquatic herbicides to knock down top-growth followed by the use of fluridone, which works quickest at the new growing points on hydrilla, is often used in the program.

11) Tuber Bank (a section of hydrosoil infested with hydrilla tubers, analogous to a "seed bank"): The most direct way to remove hydrilla tubers from a tuber bank is dredging. In addition, the number of tubers in the tuber bank can be slowly exhausted by persistent, frequent aquatic herbicide application. This will reduce the tuber population by controlling the germinated plants before they grow large enough to produce new tubers.

12) Size of Infested Area: Small infestations can be controlled with hand or mechanical control methods; larger infestations tend to require herbicide use, or biological control methods, as are used in the Imperial Irrigation District Canal with the triploid grass carp.

13) Plant Density: The lower the density of plants, the more appropriate is physical removal (hand digging).

14) Dissolved Oxygen: The use of aquatic herbicides to rapidly control a large mass of hydrilla (or any other aquatic vegetation) filling an entire water body can reduce the dissolved oxygen levels in the water body to levels unable to support fish and other aquatic organisms. Therefore, no more than (approximately) a third of the surface area of a given water body is treated with the use of rapid-action aquatic herbicides, such as copper, at a time.

15) Non-target Plants: The more sensitive the non-target plants, the more care is taken in the selection of herbicides, herbicide rates, and timing of application, and the more consideration given to mechanical or other non-chemical control methods. A lower rate of an herbicide might control hydrilla without affecting non-target plants, or timing of the application after the non-target plant has reproduced or completed its life cycle may avoid plant damage.

16) Biological Control Methods: If the infested waterway is an area where the triploid grass carp can be used according to the CDFG code, and the waterway can be enclosed by screens and gates so that the triploid grass carp cannot escape into the wild, this biological control agent can be used. All applicable permits will be obtained from the CDFG before release. The stocking rates used in an eradication project, such as the CDFA Hydrilla Eradication Program, are much higher than those used in a classical biological control program. In addition, several other biological control agents, including a tuber eating weevil and a stem-mining fly, have been tested in the past on a small scale, under controlled, quarantine conditions, but proved to be ineffective as an eradication tool in California. The CDFA Hydrilla Eradication Program is open to testing new biological control agents or techniques.

EFFICACY MONITORING

Visual Assessment: A visual assessment of beneficial and adverse effects will be conducted during surveys of treatment locations in order to assess treatment success, and adjust treatment methods as necessary. Photographs will be taken at the beginning and end of each field season, where applicable, to document changes in plant density, size, maturity, and area coverage.

All hydrilla plant infestations will be mapped using global positioning system technology and references to landmarks.

GENERAL ADMINISTRATIVE PRACTICES

Daily Activity Log: Project personnel will fill in daily activity logs accurately describing their activities.

Equipment Maintenance Log: A logbook should be kept to record daily, weekly, and monthly maintenance, service or repairs of program equipment.

Calibration Log: A logbook will be maintained with the calibration of all herbicide application equipment.